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Subsurface Characterization Using Borehole Geophysics and Shallow Seismic Reflection at Lawrence Livermore National Laboratory Site 300

We are using borehole geophysical logs and shallow seismic reflection data for subsurface characterization at Lawrence Livermore National Laboratory Site 300**.** Site 300 is a 10.5 square mile experimental test facility and Superfund site isolated in the rugged Altamont Hills of central California. These surveys are part of ongoing multi-phase Comprehensive Environmental Response, Compensation, and Liability Act investigations of trichloroethylene (TCE) contamination of ground water along the southeastern site boundary.

We conducted a test survey to determine optimal acquisition parameters for two, 12-fold common midpoint seismic reflection profiles that were located in the Corral Hollow (CH) flood plain (CH #1 and #2). Profile CH #1 was oriented parallel to the bedrock dip direction (north-northeast to south-southwest); profile CH #2 was oriented perpendicular to CH #1. An elastic band assisted 550-pound weight drop was used as the seismic energy source. We recorded seismic data using a 24-channel seismograph and 14-hertz geophones.

Average bedrock velocities ranging between 5,500 to 6,400 feet per second were measured in a ground water monitor well 300 feet deep. We used the velocity data to correlate two high-amplitude seismic reflectors with stratigraphic horizons identified using drill core and borehole geophysical logs. One reflector correlates with a conglomerate bed in the lower part of the Neroly Formation at a depth of 150 feet; a deeper reflector correlates with the Neroly-Cierbo Formation contact at 360 feet. The two reflectors are offset along a south-dipping fault identified on profile CH #1. Geophysical log correlations indicate 30 to 40 feet of displacement along the fault. Alluvial and bedrock aquifers north of the fault contain ground water with TCE concentrations up to 10,000 micrograms per liter (parts per billion [ppb]), and TCE concentrations below 5 ppb south of the fault. Studies to determine the hydrogeologic and contaminant transport implications of the fault continue.

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